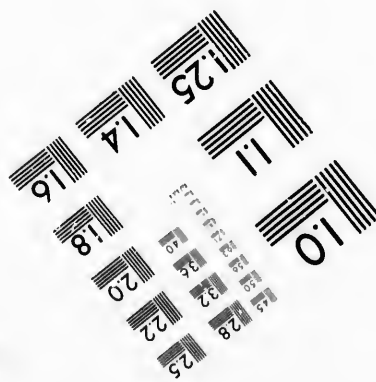
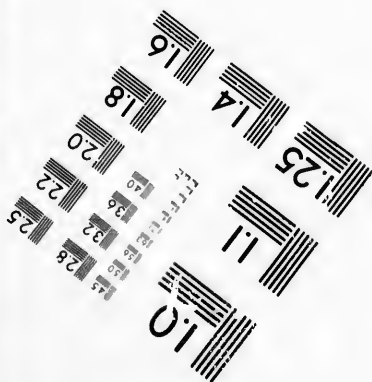
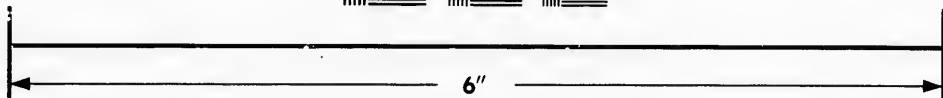
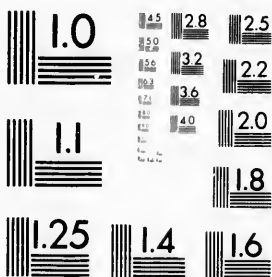


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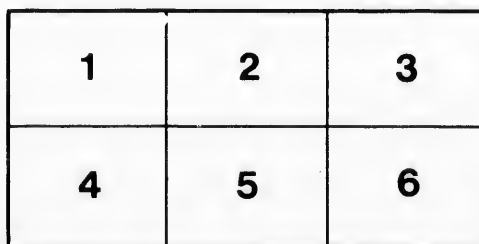
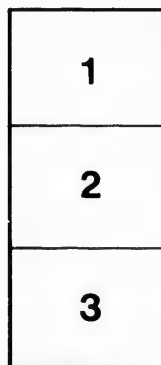
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[FROM THE CANADIAN RECORD OF SCIENCE, Vol. II., No. 3.]

## OUR NORTH-WEST PRAIRIES, THEIR ORIGIN AND THEIR FORESTS.

BY A. T. DRUMMOND.

The origin of our North-West prairies may be traced to two causes, one long since removed, the other still operating. During the pre-glacial and glacial periods, the inequalities of the surface over vast tracts of the country in our North-West were filled up by clays and gravels, and more or less levelled. These clays were, to some extent, subsequently re-arranged under water, and at the same time new material, chiefly gravels, sands and sandy loam, was deposited. Then these extensive tracts were gradually upheaved above the level of the water or were left dry by the fall in the water through the diminution in the sources of supply, or by the greater facilities afforded for rapid drainage. There had been previous upheavals during the drift period, and there were traces of resulting vegetation. The second cause, then, or immediately previously, came into play, and consisted in the annual growth and decay, for long periods of time, of grasses, sedges and aquatic plants generally, over extensive areas in the shallower waters and along the shallow lake margins, each year forming a deposit there on the lake bottom and gradually thus increasing the encroachments of the land upon the water.

There is strong evidence which seems to point to the fact that about the close of the drift period, or immediately after it, when the glaciers, probably, were slowly retreating, the central portions of the continent formed the bed of a vast fresh water inland sea, of which Lakes Winnipeg, Manitoba and Winnipegosis, are now the mere remnants. The outlet of this sea to the ocean was probably at that time by way of the Mississippi Valley. Into this sea the glaciers from the

Ms. A. T. Drummond

Rocky Mountains and from the country north and east of the Saskatchewan, perhaps for long periods of time, flowed, and huge icebergs freighted with boulders, debris and earth were continuously floated off to wend their way at the will of winds and currents. It was not the first time during the drift period that this part of the country had been under water. The resemblance to the Polar Seas of to-day was probably very striking, except in these points that the icebergs would be more deeply sunken, for the water was fresh, and that this inland sea was more vast, covering not merely our North-West prairies, but extending probably as far south as Iowa and Illinois. Boulders were thus scattered at random over the bottom of the sea hundreds of miles away from their point of origin. Huge masses were carried enormous distances. Dr. George Dawson mentions one of the Huronian quartzite, lying near the Waterton River, which measured forty-two feet long, forty feet broad and twenty feet high, and which must have come from east of Lake Winnipeg or the Red River.

The very uniform nature of the deposits over very great areas would indicate quiet waters, at least in later periods of the occurrence of this inland sea, probably ending, as the land rose, in the creation of vast marshes, like the existing great grass swamps at Westbourne, and on the Boyne River in Manitoba, but on an immense scale. The successive annual growth and decay of sedges and grasses in these marshes gave rise to deposits of vegetable loam which have gone on increasing since the rise of the land to its present level, by the annual decay of the ordinary prairie grasses, and perhaps of forest trees. The elevation which took place in the land was greatest at the Rocky Mountains and the different steppes between these mountains and the eastern limits of the prairie, would seem to indicate different stages or intervals in the elevation during which the various sandhills and stretches of sand at the extended edges of these stoppes have been formed. The contraction in the area of this inland ocean took place from the Rocky Mountains eastward, so that the present Province of Manitoba east of the Duck, Riding and Pembina Mountains, is the most recently formed

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as well as the lowest in level. Between the mouth of the Saskatchewan at Grand Rapids and the Assiniboine River between Portage la Prairie and Winnipeg and thence to the United States boundary line, there is not much difference in level, as the following heights above the sea indicate:

Lake Winnipeg.....	710 feet.
St. Martin's Lake .....	737 "
Lake Manitoba.....	752 "
River Assiniboine, near Baie St. Paul.....	766 "
Lake Winnipegosis.....	770 "
Cedar Lake, near Grand Rapids, on the Saskatchewan.....	770 "

This comparatively level area occupies a stretch of country 330 miles in length by an average of 150 miles in breadth.

Lakes Winnipegosis and Manitoba, and St. Martin's and Water Hen Lakes, are mere shallow depressions on the surface of the prairie. The two first named lakes are each over a hundred miles in length, but increase in depth so gradually that at the narrows where they nearly unite, Winnipegosis has only six feet of water at 2,000 feet from the shore, whilst Lake Manitoba, at a mile from the shore, shows a depth of only three feet. St. Martin's Lake, again, has only eight feet, and Water Hen Lake an average of three feet of water. Lake Winnipeg is deeper, being an average of forty feet to sixty feet, with a somewhat uniformly level bottom, but it is relatively very shallow for a lake of its great extent. Its eastern shores form here the western limits so far as observable, of the great eozoic rocks, and were also, no doubt, the eastern shore of the great inland sea.

It has been proposed to lower the level of Lake Manitoba by removing the obstructions in the channel through which its waters are conducted by way of St. Martin's Lake to Lake Winnipeg, and there is no doubt that if this could be effected to the extent of only a few feet, large tracts of country would be reclaimed which around its margin are presently more or less under water. The southern end of the lake is now bounded by a narrow sand bank elevated a few feet

above the water. Inside of this are very considerable tracts once forming a part of the lake and now more or less submerged, but in which the process of growth and decay of the grasses and aquatic plants and the resulting annual deposit of soil will eventually end in their reclamation from the water. This same process is going on in a large tract covering four or five townships about ten miles to the westward of Lake Manitoba, known as the Big Grass Marsh, as well as in many other places in the province, and will, in coming years, result in the formation of prairie land with a rich covering of black vegetable loam.

The County of Essex in Ontario has a considerable extent of prairie land which was no doubt largely formed under similar conditions of annual growth and decay, and which in its origin points to a time when Lakes Erie and St. Clair, were more intimately connected than they now are. Long Point, Point Pelée and Sandusky Harbour, all on Lake Erie, are illustrations of prairies now in process of formation. These prairies all have a fresh water origin. Those south of Montreal, and extending beyond St. Johns and St. Hyacinthe, are rather of marine origin, dating back to the Leda clay period, when the drift clays were re-assorted under water and added to, and the land then elevated to its present level.

Probably contemporaneous with the formation of the prairies was the creation of the deep valleys of the Assiniboine and the Qu'Appelle Rivers. The valley of the Assiniboine above Brandon has an average depth of towards 200 feet; that of the Qu'Appelle is somewhat less. Their width varies from half a mile to a mile. As the waters fell in the prairie country to the east of Brandon, these rivers, which appear to have been enormous streams with strong currents, cut their way into the drift deposits of the upper steppe gradually downward to the level of the lower steppe below Brandon. The sources of supply for these streams may have been in part the retreating glaciers, but were more probably a greater rainfall than now and the general drainage of the country through which they ran. This country must have been in its earlier days covered with grass



marshes. The smaller river valleys as those of the Souris, Cut Arm Creek and the Little Saskatchewan have probably somewhat similar origins. A contributing cause in every case has however no doubt been the annual spring freshets which extend into the month of July in the larger rivers, and which year by year carry down with them in their constantly turbid waters large quantities of soil to the Red River.

A writer in the February number of *The Century*, speaking of the vast prairies of the valley of the Mississippi and its tributary streams, tells us "This region was not originally wooded. This is proved not only by the story told by the soil, but by the fact that though it was not without its woodlands at its settlement, it has no characteristic trees. All are derived either from the Appalachian region or from the west and north, ninety varieties coming from the east and only nine or ten from the west and north. The great prairie region has sought all the trees it possesses from adjoining regions." This opinion probably expresses the generally prevailing impression of the relations of forest trees to the prairies. And yet in regard to our Canadian prairies, whether in the North-west or in Ontario and Quebec, it is not altogether correct. The subject is in some respects associated with the early history of the prairies. There is no doubt that when these prairies were in process of formation, when immense areas were in the condition of marsh in which tall grasses were the leading feature, and when this marsh was being gradually changed in its character to dry land by the successive annual growth and decay of these grasses, circumstances existed which rendered the growth of forest trees impossible. Great tracts of country are still in this condition. There are also many areas of great extent, as on the Pembina branch of the Canadian Pacific Railway, around Gladstone and Westbourne on the Manitoba & Northwestern Railway, and between Baie St. Paul and Lake Manitoba, where, during the wet seasons—and these seem periodically to follow each other for two and three years in succession—very extensive tracts of magnificent prairie land, which in other seasons are dry and capable of cultiva-

tion, are practically under water for most of the summer months. Thus trees, which in dry seasons might spring up in such stretches of country, would during the successive wet seasons be gradually killed. Wherever such conditions have prevailed, whether in far distant or present times, forests, for the time, could not be expected to appear.

The question however arises whether, once the condition of dry land was attained, did trees spread over the prairies as they have elsewhere, and whether subsequent causes may not have prevailed in removing them. That certain trees will freely grow on the prairies is proved by the frequent bluffs of timber, especially to the north of the Assiniboine and Qu'Appelle. These bluffs often occur in stretches of miles in extent and often again are found isolated. North of the Qu'Appelle they are so frequent as to give the country a park-like appearance and to render that country very attractive for settlement. Beyond this point northward they continue to occur until they finally merge into the true forest region which in this section extends from Lake Winnipeg westward to the sources of the Athabasca River, and from between these localities northward to the extreme limits of forest growth—including within this are a great stretches of what should correctly be termed prairie country. On the prairies proper the prevailing trees are the poplars, and only in the deep river valleys or skirting the margins of the lakes and the smaller streams and on the hills are the other trees of the prairies found in numbers.

It is quite true that the total number of species of trees in our North-west is limited. Most of the Ontario and Quebec species do not range west of Lake Superior or Lake of the Woods and probably Manitoba, west of the Red River, does not include more than sixteen species. Were there, however, forests in this part of Manitoba as there are in Ontario and Quebec, this paucity of species would probably not be so marked. That there has been a time when the present prairies of Manitoba and the North-west Territories have been more or less under wood is extremely probable. There seems no reason why the true forests should have extended everywhere northward, often covering, even there,

what would be otherwise prairie, and should have left the vast country to the south an open, more or less treeless, plain. The deep valleys of the Assiniboine, Qu'Appelle and other streams would seem to indicate a greater rainfall to have at one time prevailed, and this greater rainfall would result from extended areas of forest. It is not an argument against this that the prairies with us can hardly be said to have any characteristic trees. The vast forests to the northward have none. It is not because trees will not grow, as bluffs of timber are of frequent occurrence and wherever tried, hardy trees, when properly protected, readily thrive. Those who have observed the almost yearly occurrence in almost every part of the prairie country of great fires, sweeping sometimes over immense stretches of country, and of the destructive effects of forest fires in Ontario and Quebec, can readily suppose that such fires may have been an important factor in rendering the prairies largely treeless and that, aided by the light rainfall and the dry atmosphere, they have gradually widened the areas originally burned, until these areas have attained their present extent. The general flatness of the country and consequent exposure to winds has contributed much to the rapid accomplishment of this. In the country bordering the upper reaches of the Peace and Athabasca Rivers and their tributaries there are at present large stretches of prairie land completely surrounded by forest, and which suggest an origin resulting from forest fires. Prairie fires are almost invariably the result of human agency, so that the present condition of the prairies probably dates its origin within a comparatively recent period. Certainly these prairie fires now prevent the encroachments of the forest upon the plain, as otherwise these forests would in the natural order of things extend themselves westward and southward if allowed to do so. The same is true of the bluffs or stretches of timber found growing in frequent places south of the true forests, though even there the trees are of relatively moderate size proving that these bluffs are of comparatively recent or of very slow growth. There can be no question that as prairie fires cease with the progress

of cultivation of the land and with the enforcement of preventive laws, the tendency of these stretches of timber and of the true forests will be to extend themselves further over the prairie. In the meantime, the effect of the absence of timber is to create a drier climate by diminishing the rainfall, and on account of the general flatness of the prairie by exposing every object upon it to constant and unbroken, drying winds. That there is, therefore, a general tendency of trees to skirt the river banks can be readily understood, as there they obtain that moister atmosphere which is absent on the open prairie. Even in the valleys of such great streams as the Assiniboine and the Qu'Appelle, trees are generally found on the southwestern or western sides, the eastern being frequently bare, and this can only be accounted for by the greater protection from drying winds the western and southern banks have, and therefore the greater moisture in the soil there.

Again, only in the river valleys, on and near the lake margins and on the hills or rising grounds are the forest trees of the North-west completely represented, and it is suggestive whether the trees there are not the relics of a larger forest flora which more or less covered the whole country. At present the cosmopolitan poplars are the chief occupants of the plains, their very hardiness, however, constituting them fitting pioneers of new forests some day to appear.

I cannot help thinking that as the prairies become thickly settled and protective laws are properly enforced, prairie fires will largely cease and trees will have an opportunity to extend their area of growth in every direction. Further, as cultivation increases and a drainage system is more generally carried out, summer frosts will largely disappear and the climate become more suitable for forest trees as well as grain. The extension of the forests will, no doubt, have its effect in somewhat increasing the rainfall, but will also afford breaks to the winds which now prevail. The general effect must be a modification of the climate in some degree, probably rendering the atmosphere less dry and somewhat moderating the cold in winter.

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